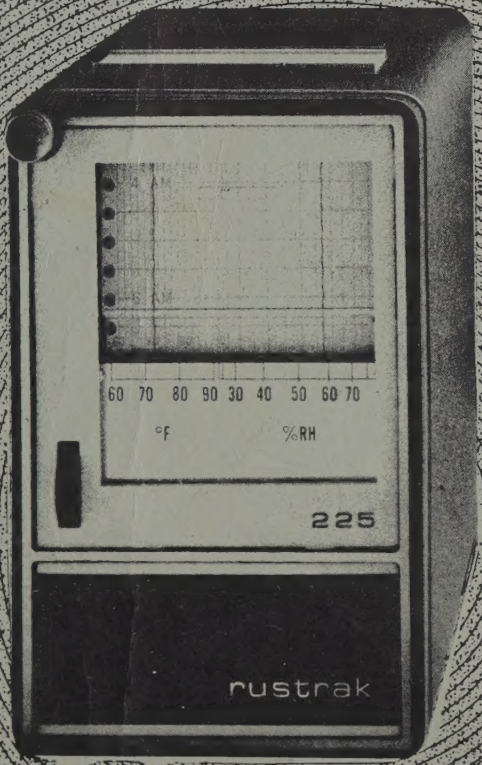
Model 225

RH-TEMP Recorder



Welcome to the world of accurate and continuous relative humidity/ temperature recording.

The Rustrak Model 225 RH/TEMP recorder is not only simple to install but also easy to read.

First, spend a few moments reading this manual. Then monitor relative humidity and temperature the easy, permanent, electronic recorder way.

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INSTALLATION INSTRUCTIONS

Before using recorder, install it in its permanent location. All hardware is furnished with the recorder package.

1. Using bracket on sensor housing as a template, locate two holes and mount sensor with 2 #8 wood screws furnished. Sensor should be located in area with free air circulation. Note that sensor housing can be up to six feet from recorder (or up to 100 feet away with optional cable).

2. Recorder is ready to install as received. It can be placed on a desk or table or mounted to a wall with bracket furnished. To wall-mount, attach bracket to recorder rear with two 8-32 machine screws furnished. Mount to wall with two #8 wood screws.

OPERATION CHECK

3. With recorder installed and Style "P" Chart paper factory loaded, plug sensor cable into socket at rear of recorder. Insert recorder line plug into outlet of proper voltage (usually 117VAC–see nameplate) and set slide switch on case rear to "ON." **Never operate recorder without sensor cable properly inserted.**

4. Recorder samples temperature and relative humidity in sequence. It prints one dot in one channel then switches to the other channel to record that value.

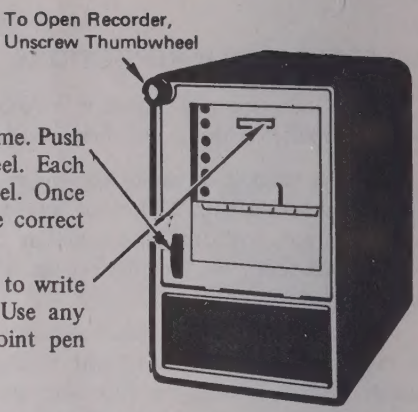
LOADING CHART PAPER

5. There are two chart loading options: Reroll and Tear-Off. With Reroll, the chart paper remains inside recorder after use and can be stored as a roll after two months. Tear-Off mode means that chart paper feeds out the top of recorder and is torn off in arbitrary lengths for flat storage.

Open recorder and study chart paper while reading through Chart Loading Instructions in this manual. You will then have no difficulty reloading when chart paper supply is depleted.

Use Style "P" Chart Paper Available From Factory or From Your Nearest Rustrak Representative or Distributor

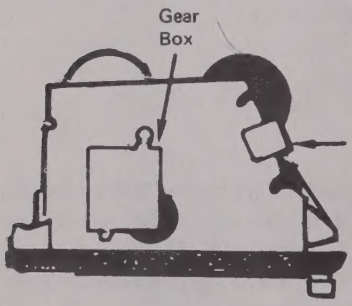
OPERATING HINTS



Before recording . . .

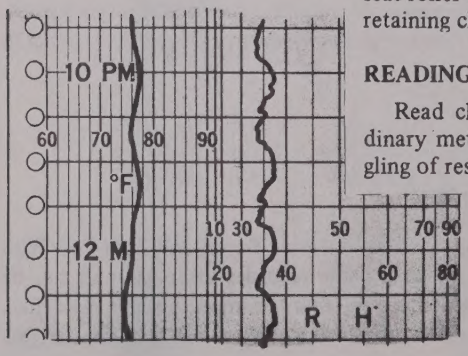
Set strip chart to correct time. Push and turn down thumbwheel. Each hour equals ½" chart travel. Once set, the chart will indicate correct time until depleted.

Slide down access window to write date at start of record. Use any sharp object, key, ball point pen (with or without ink).



During recording . . .
QUICK REVIEW (Reroll Mode)

To review recorded information, open recorder, unsnap left retaining clip (side nearest gear box). Move recorded chart paper roll to notch nearer top of recorder and close retaining clip. Paper is now free to unroll even while recording. After review, be sure to rewind recorded chart paper. Use thumbwheel. Reseat roller in deeper notch and close retaining clip.



Style P Chart Paper
(actual size)

READING CHART (SEE TRACE)

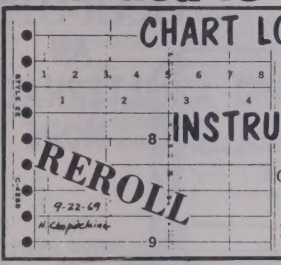
Read chart as you would an ordinary meter. No arithmetic or juggling of results are necessary.

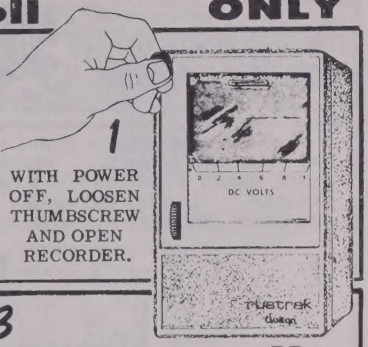
EXTENSION CABLES

Electrical sensors can be located up to 100 feet from the recorder. Extension cables are available. To use, insert extensions in line with sensor cable.

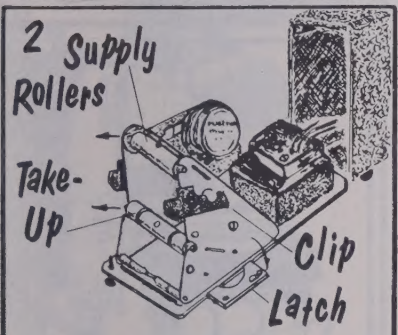
USE STYLE "P" CHART PAPER ONLY

Intended for full roll ONLY



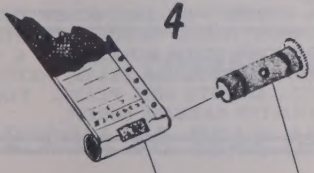


1. WITH POWER OFF, LOOSEN THUMBSCREW AND OPEN RECORDER.



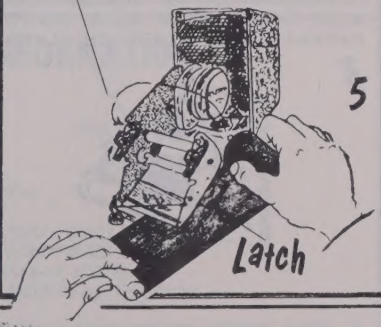
2. UNLATCH RETAINING CLIPS, OPEN CHASSIS LATCH. 3. REMOVE BOTH SUPPLY AND TAKE-UP ROLLERS.

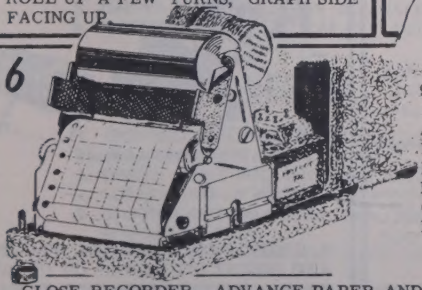
4. SLIDE CHART PAPER SPOOL ONTO SUPPLY ROLLER, PERFORATED EDGE OF PAPER BUTTS ROLLER SHOULDER. (SAVE GUMMED TAPE FOR STEP 6)



5. SLIDE EMPTY SLEEVE ON ROLLER. 6. TAPE PAPER TO SLEEVE, MAKING SURE PAPER IS PROPERLY ALIGNED. ROLL UP A FEW TURNS, GRAPH SIDE FACING UP.

7. KEEP ROLLS SNUG, WITH ANGULAR MOTION SLIDE PAPER LOOP (PERFORATED EDGE FIRST, BACK SIDE UP) INTO SLOT BETWEEN SIDE PLATE AND LATCH. 8. CAREFULLY ENGAGE SPROCKETS OF DRIVE DRUM WITH PAPER PERFORATIONS. INSERT SUPPLY ROLLER INTO TOP NOTCHES.



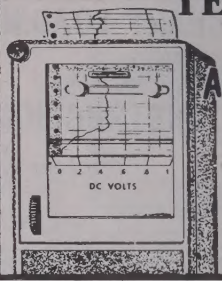


9. KEEPING PAPER TAUT, BRING TAKE-UP ROLLER INTO POSITION AND DROP INTO DEEPER NOTCH, ENGAGING GEAR. CHECK PAPER PERFORATIONS AND SEATING OF ROLLER. 10. LOCK RETAINING CLIPS AND SNAP CHASSIS LATCH INTO SIDE PLATE.

CLOSE RECORDER. ADVANCE PAPER AND SET TIME BY DEPRESSING AND TURNING CHART ADVANCE WHEEL.

SAVE CARDBOARD SLEEVE FOR REROLL

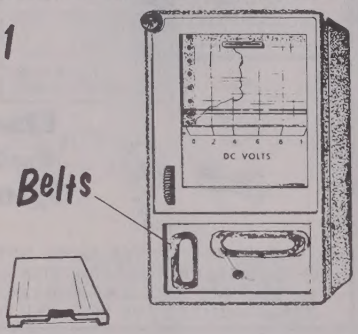
TEAR-OFF AN ALTERNATE MODE



USES DRIVE BELTS

1. SNAP OUT NAMEPLATE PANEL USING FINE SCREWDRIVER. REMOVE DRIVE BELTS AND REPLACE NAMEPLATE. 2. OPEN RECORDER BY LOOSENING KNURLED THUMBSCREW.

1



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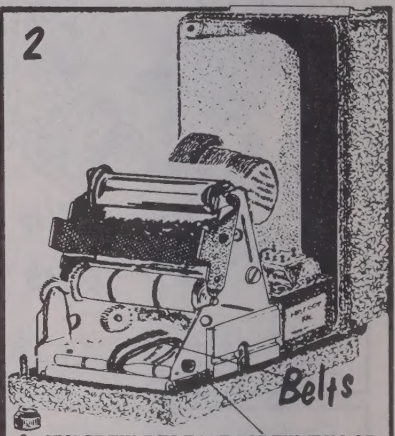
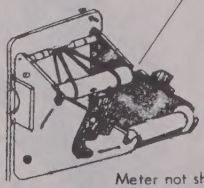


3. UNSCREW RELEASE SCREW TWO OR THREE TURNS. SPRING SIDE PLATE, REMOVE GUIDE ROLLER. 4. SLIP ROLLER THROUGH BELTS, REINSERT ROLLER INTO SIDE PLATE. FINGER TIGHTEN RELEASE SCREW.

5. UNLATCH RETAINING CLIPS, REMOVE TAKE-UP ROLLER. MAKE SURE CARDBOARD SLEEVE IS OFF ROLLER. 6. PASS ROLLER THRU BELTS, SEAT ROLLER IN PLATES. ROLLER GEAR MUST ENGAGE IDLER GEAR; SEAT IN DEEPER NOTCH OF LEFT SIDE PLATE.

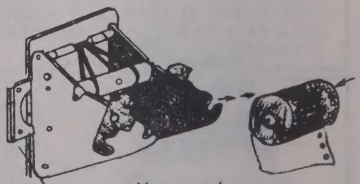
3



Meter not shown

7. PULL DRIVE BELTS INTO LARGE CHAMFERED GROOVE OF GUIDE ROLLER & 'V' SLOTS ON TAKE-UP ROLLER.

4



Meter not shown

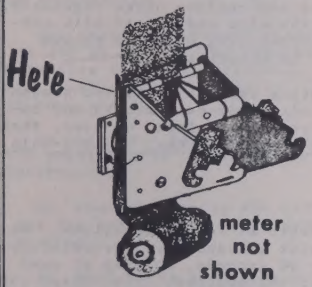
8. OPEN LATCH. REMOVE ROLLER AND INSERT INTO SPOOL OF CHART PAPER. PERFORATED EDGE OF PAPER MUST BUTT ROLLER SHOULDER.

PARTIALLY-USED ROLL OF CHART PAPER WILL OPERATE TEAR-OFF. USE ONLY FULL 63 FOOT ROLL FOR REROLL.

11-22-69 # Complete/one

9. UNROLL ABOUT SIX INCHES OF PAPER. WITH AN ANGULAR MOTION SLIDE PAPER (PERFORATED EDGES FIRST, BACK SIDE UP) INTO SLOT BETWEEN THE RIGHT SIDE PLATE AND CHASSIS LATCH.

5



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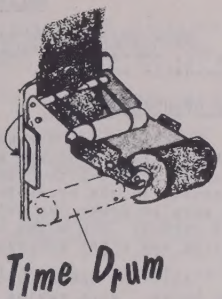


10. SEAT SUPPLY ROLL IN NOTCHES PROVIDED, CLOSE RETAINING CLIPS. 11. CAREFULLY ENGAGE CHART PAPER PERFORATIONS WITH SPROCKETS ON TIME DRUM. 12. SNAP LATCH INTO SIDE PLATE. 13. WITH CHART PAPER UNDER GUIDE ROLLER, PULL BOTH DRIVE BELTS INTO SMALL 'V' SLOTS ON GUIDE ROLLER.

9-24-69 H. Chapdelaine -

CLOSE RECORDER, TIGHTEN THUMBSCREW. WITH POWER APPLIED, RECORDER IS READY FOR TEAR-OFF OPERATION. ADVANCE PAPER AND SET TIME BY DEPRESSING AND TURNING CHART ADVANCE WHEEL.

CONVERSION INFORMATION

REROLL TO TEAR-OFF

USES DRIVE BELTS.

1. OPEN RECORDER. DROP CHASSIS LATCH.
2. UNLATCH BOTH RETAINING CLIPS.
3. REMOVE SUPPLY ROLL AND TAKE-UP ROLL. CLEAR THEM.
4. FIND DRIVE BELTS IN WELLS UNDER FRONT NAMEPLATE.
5. REMOVE CARDBOARD SLEEVE FROM TAKE-UP ROLLER.
6. PROCEED WITH STEP 3 IN TEAR-OFF LOADING INSTRUCTIONS.

TEAR-OFF TO REROLL

USES CARDBOARD SLEEVE.

1. OPEN RECORDER. DROP CHASSIS LATCH.
2. UNLATCH BOTH RETAINING CLIPS.
3. REMOVE SUPPLY ROLL AND CLEAR ROLLER.
4. SLIP OUT TAKE-UP ROLLER FROM WITHIN DRIVE BELTS.
5. UNSCREW KNURLED RELEASE SCREW, SWING OUT GUIDE ROLLER AND REMOVE BELTS.
6. REPLACE GUIDE ROLLER AND FINGER TIGHTEN KNURLED RELEASE SCREW.
7. STORE DRIVE BELTS IN WELLS PROVIDED UNDER FRONT NAMEPLATE.
8. CONTINUE WITH STEP 4 IN REROLL LOADING INSTRUCTIONS.

DO NOT OPERATE REROLL WITH LESS THAN 63 FOOT ROLL.

PRACTICAL HINTS ON RELATIVE HUMIDITY MEASUREMENT

Care must be exercized when taking RH measurements to obtain meaningful, reproducable data. The basic practices outlined here will give reasonable accuracy.

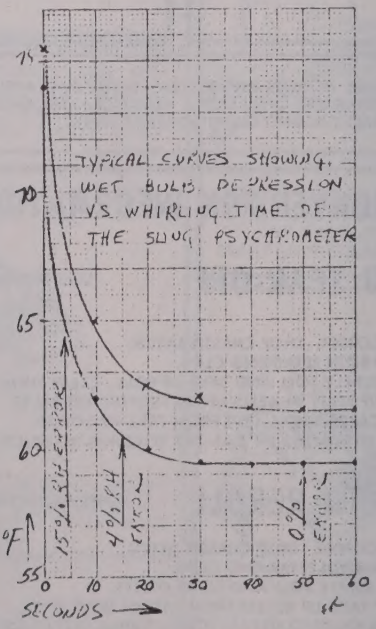
USE OF HYGROMETERS

Care should be taken to keep the wick clean and supplied with distilled water. Soluble salts and dirt particles accummulated on the wick adversely affect the rate of evaporation and capillarity, causing inaccuracies in the wet-bulb readings. Discard and replace wicks regularly. Be sure to cover the bulb completely with the wick and tie it with cotton thread. New wicks should be boiled in distilled water to remove sizing and other foreign materials present in manufacture.

Accuracy can be obtained only by creating rapid circulation around the bulbs. When taking readings, fan the air vigorously around the instrument with hand fan or similar device for a full minute or more, then immediately take the readings...first, the web-bulb; then, the dry-bulb. (See para. 4)

USE OF THE SLING PSYCHROMETER

Saturate the wicking with distilled water at room temperature. Be sure the entire bulb is covered with the wick and that it is completely saturated. Whirl the instrument for 15 or 20 seconds, holding it away from the body. Stop and read the wet-bulb, thermometer; then repeat the whirling operation until two or more wet-bulb readings agree at the lowest indication obtainable. The wicking must be kept perfectly clean and thoroughly saturated to secure accurate indication.



ACCURACY OF THE WET-DRY BULBS

The average inexpensive sling Psychrometer or Hygrometer purchased from a scientific supply house is not a precision device. However with the proper precautions good accuracy can be acheived.

1) Compare the two thermometer readings to be sure they are matched. This can be done simply by placing both bulbs in a room temperature water bath. To check the thermometers over the temperature range place both thermometers in cool water with their bulbs wired together and take readings on both thermometers as the water temperature slowly comes to room temperature.

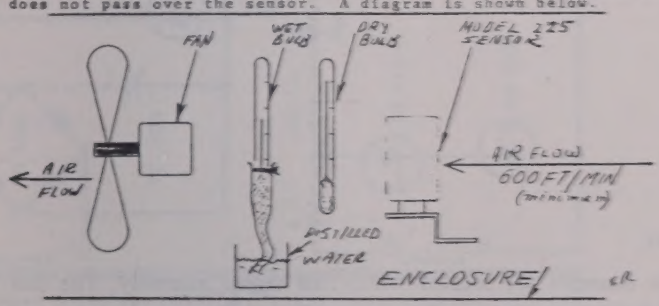
One degree Fahrenheit mismatch between the two thermometers can cause up to 10% RH error. The obsolute accuracy of the thermometers at room temperature is not so critical. One degree inaccuracy of both thermometers would cause about 1% RH error. If the thermometers are not matched, correct your readings.

An excellent home made Hygrometer can be constructed using two 54 to 101°F precision 18" thermometers calibrated in .1°F increments such as ASTM5OFTAGUSAF.

2) When saturating the wick be careful not to get droplets of water on the dry bulb. This would depress the dry bulb reading and produce high RH readings.

3) When using the sling psychrometer, saturate the wick. If a second set of readings is taken without saturating the wick it may be nearly dried out and not produce as low a temperature reading as it would otherwise. This will produce high RH measurements. When checking the calibration of the Model 225 by comparing it to a hygrometer or psychrometer, perform the measurement as close as possible to the Model 225 sensor. Don't hover over the sensor. The heat and humidity from your body will give large errors. Don't assume that the humidity is constant throught the room. Don't rely on just one measurement but rather several over a period of time to establish accuracy. If several readings don't follow a pattern there is undoubtedly a flaw in your method.

4) The relative humidity tables supplied by the Bureau of Standards are correct only with an air movement of at least 600 ft./min. If an electric fan is used, place the fan in such a position that the heat from the motor does not pass over the thermometers. Similarly when comparing to the Model 225 readings, position the sensor so that the moisture from the wet bulb does not pass over the sensor. A diagram is shown below.



If the foregoing procedures are observed, the results will be accurate enough to determine if the recorder is within its stated accuracy at the ambient temperature and humidity. To check the calibration over the entire scale, access to a controlled humidity chamber traceable to the Bureau of Standards is a necessity.

CIRCUIT DESCRIPTION

Temperature Channel

The temperature portion of the Model 225 RH/TEMP recorder is a DC bridge with a thermistor sensor in one leg. Output of the bridge varies between 10 to 50 microamperes, corresponding to a temperature range of 60 to 90 degrees Fahrenheit. The bridge output feeds the galvanometer through an automatic switch that selects temperature and humidity outputs alternately.

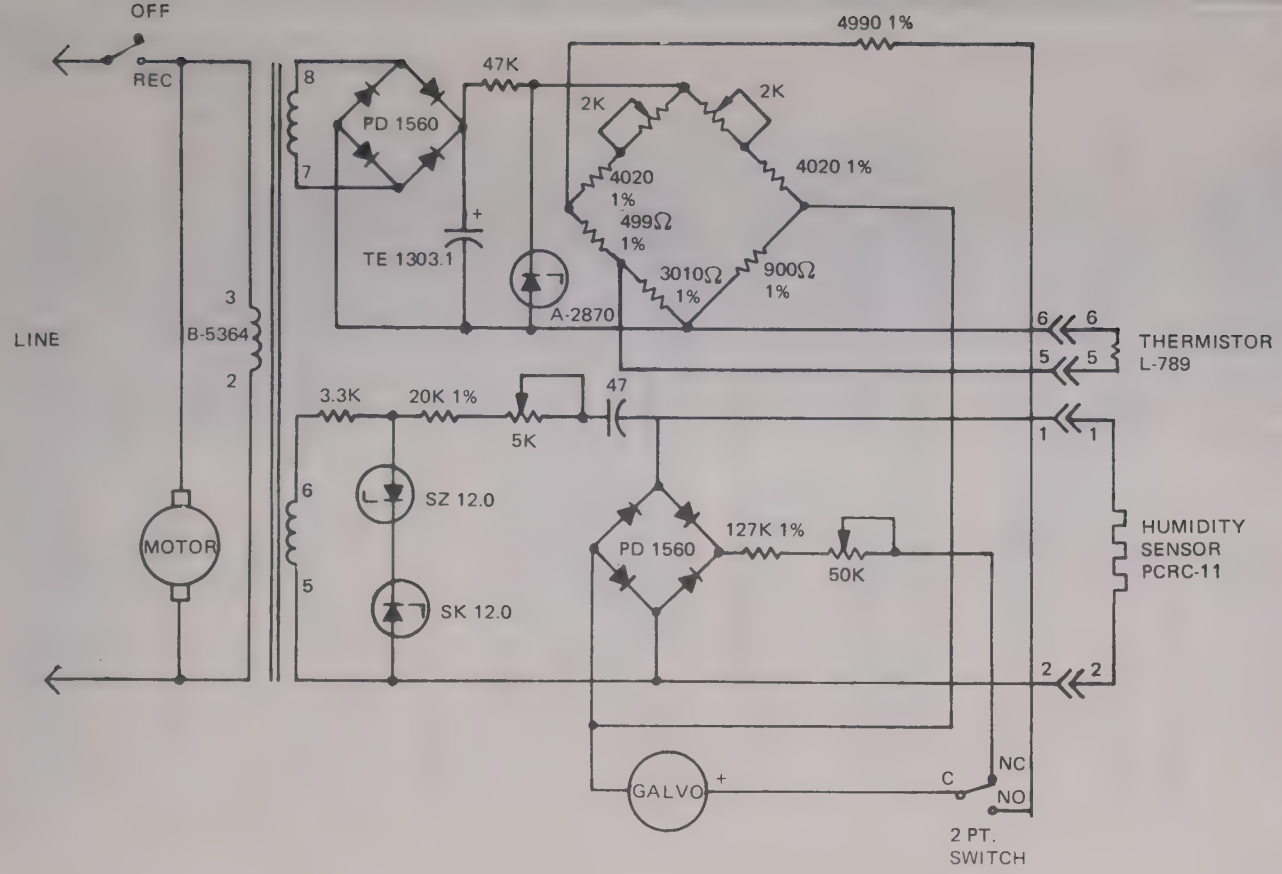
Relative Humidity

This channel is an AC operated electronic hygrometer with an electro-humidity sensor as a variable impedance device. The sensor is connected in a voltage divider configuration. AC voltage across the sensor is rectified and applied to the galvanometer through the channel selector switch.

Sensors

Two elements are located within the sensor assembly. The thermistor is a temperature-sensitive resistor that changes conductance with changes in temperature. Humidity is monitored through an electro-humidity sensor that changes impedance with variations in humidity.

The electro-humidity sensor is a processed polystyrene element with an electrically conducting surface layer bonded to a substrate. When installed into the sensor housing, this element has been preconditioned, calibrated and tested to conform to a standard calibration curve. It is therefore a precision device that should be handled with care.


OFF
REC
LINE
B-5364
MOTOR
PD 1560
47K
4990 1%
2K
2K
4020 1%
4020 1%
499Ω 1%
3010Ω 1%
900Ω 1%
TE 1303.1
A-2870
THERMISTOR L-789
3.3K
20K 1%
5K
47
SZ 12.0
SK 12.0
PD 1560
127K 1%
50K
HUMIDITY SENSOR PCRC-11
GALVO
NC
C
NO
2 PT. SWITCH

HOW TO CALIBRATE YOUR RH/TEMP RECORDER

(Do Not Calibrate Without Proper Equipment)

Equipment Needed

1) Decade box with 1, 10, 100, and 1000 ohm steps (.25% accuracy)
2) Decade box with 100, 1000, 10,000 and 100,00 ohm steps (1% accuracy)
3) Decade box with .01, and .1 MFD steps. (10%) accuracy)
4) Standard 6 Pin Rustrak connector (Male)

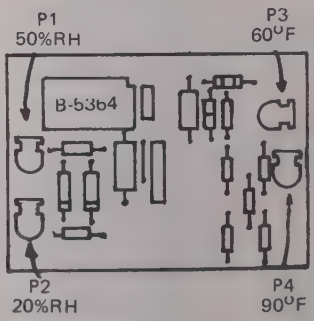
Connect leads to pins 1, 2, 5, and 6. (See Schematic, page 7)
Connect boxes 2 and 3 in parallel with pins 1 and 2 (humidity channel)
Connect box 1 to pins 5 and 6 (temperature channel)

Setting for decade boxes

(a) 3100 ohms shunted by 0.8 MFD (80%RH)
(b) 20,000 ohms shunted by .04 MFD (50%RH)
(c) 650,000 ohms no shunt capacity (20%RH)
(d) 3438 ohms (60°F)
(e) 2673 ohms (70°F)
(f) 2095 ohms (80°F)
(g) 1650 ohms (90°F)

Procedure:

SET TO	ADJUST	READING
a e	glavonometer zero	80%RH
b e	P1	50%RH
c e	P2	20%RH
REPEAT a e, b e, c e, as required		
d b	P3	60°F
g b	P4	90°F
REPEAT d b, g b as required		



INSIDE P.C. CARD

CHECK LINEARITY by setting to db, eb, fb, & gb for 60, 70, 80 and 90°F

HINTS FOR LONG SENSOR LIFE

1. Never disassemble sensor case. If however it is ever opened, touch the humidity sensor by its edges only, never its flat surface.
2. Never immerse the sensor assembly in water or other solvent. It is intended for use in gases only, not liquids.
3. Don't obstruct air flow to or around the sensor housing. If the sensor is to do its duty and do it well, it requires unrestricted air flow.
4. Don't expose the sensor to organic solvent vapors. Any chemical compound that attacks polystyrene could affect sensor performance.
5. Dust on the sensor surface does not affect sensor accuracy; it slows sensor response. If a heavy dust accumulates on the sensor, use a gentle and clean (oil-free) air blast to remove. Avoid any oil or oil vapors near the sensor.
6. Since polystyrene is sensitive to sulfur gases, don't blow smoke at the sensor.
7. Be gentle with the sensor. Don't drop it or subject it to mechanical abuse.
8. Don't use any cleaner in spray aerosol cans near the sensor.
9. And finally, never operate the RH/TEMP recorder without the sensor cable properly inserted in the socket on the case rear.

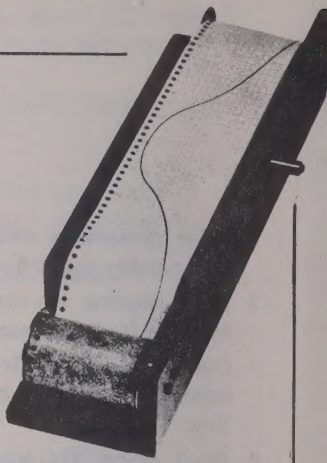
NEVER CHECK RESISTANCE OF HUMIDITY SENSOR WITH OHMMETER

ACCESSORIES FOR YOUR RH/TEMP RECORDER

Style P Chart Paper: in rolls of 63 feet for 2 months' duration.

Extension Cables: Available in lengths of 25 feet, 50 feet, or 100 feet.

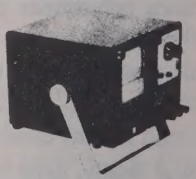
168 Chart Viewer. Review one foot chart paper roll in seconds. Rewind immediately. Reduces handling marks. Takes charts up to 3" wide.

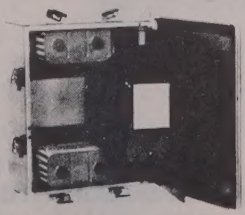


2176 Rack Mounting Panels. Standard aluminum 19" rack panels with cutouts for 2, 3 or 4 recorders, finished in contrasting grey epoxy suede paint. Blind studs for mounting or can be used with optional escutcheon.

2196 Escutcheon. Aluminum construction, available in matching grey. Quick-Mount feature anchors recorder while escutcheon finishes panel.

172 Portable Dual-Pack Case. Aluminum case finished to match Rustrak recorders. Model 172-1 mounts one recorder and has blank panel for your equipment. See Model 2195 illustration. Model 172-2 mounts two recorders. Size, 7¼ x 5 5/8 x 7½.





197 Weatherproof Enclosure. Hammertone-finished fourteen gauge steel case with mounting flanges and neoprene gasket seal mounts one recorder. Also includes brackets for two batteries. Weatherproof connector for wiring. Swing-out feature for reloading. Accommodates all Rustrak recorders.

WARRANTY

GRAPHIC INSTRUMENTS DIVISION, GULTON INDUSTRIES INCORPORATED warrants RUSTRAK products described in this manual to be free of defects in material and workmanship under normal usage and service for a period of one year from the date of its initial purchase from the factory or an authorized GRAPHIC INSTRUMENTS DIVISION representative or distributor. The company's obligation under this warranty is limited to repairing or replacing any instrument or component which upon examination by factory personnel, is found not to conform to the foregoing warranty. The instrument must be returned to the factory* all transportation prepaid. We shall not be liable for any damages, consequential or otherwise.

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